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V.

INJURIOUS INSECTS AND OTHER ANIMALS OBSERVED IN IRELAND DURING THE YEAR 1911.

By GEORGE H. CARPENTER, B.SC., LOND.; M.R.I.A.; F.E.S.; Professor of Zoology in the Royal College of Science for Ireland; President of the Association of Economic Biologists; and Consulting Entomologist to the Royal Dublin Society.

(PLATES VIII. AND IX.)

[Read, MAY 21; Ordered for Publication, JUNE 11; Published AUGUST 19, 1912.]

CABBAGE AND TURNIP INSECTS.

The Swede Midge.

Contarinia nasturtii, Kieffer.

IN the last paper of this series (5, pp. 32–4) reference was made to an undetermined gall-midge (Cecidomyid) grub, found in numbers between the leaf-stalk bases of swedes near Dundalk, and apparently causing the curious deformation of growth which has been termed "cabbage-head." The same diseased condition has been known for some years past in Yorkshire, where it is called "cabbage-top," and a description of the midge, with an account of its life-history, has been lately published by Taylor (11). The midge, numerous specimens of which have been reared at the Garforth farm, near Leeds, has been identified by Mr. P. H. Grimshaw and the Abbé Kieffer as *Contarinia nasturtii* of the last-named author.

This midge is a minute insect, measuring only 1·5 mm. (about $\frac{1}{16}$ inch) in length. It is light yellowish-brown in colour, with dark markings on the dorsal surface of the body generally, and on the sides of the thorax. It was first described by Kieffer in 1888 (6, p. 263), and its grubs have been found by him feeding on various cruciferous plants.

The male (fig. 1) may be distinguished from the female by the longer feelers and the upturned processes at the tail-end of the abdomen. When the midges first appear in early summer, we are

Fig. 1.—Swede Midge (*Contarinia nasturtii*). Male.
After Taylor. Magnified 30 times.

informed by Taylor that "they betake themselves to the swedes, and for a few days they may be found either lurking amidst the crowns, resting on the under surface of the leaves, or, when the weather is favourable, flying about the field."

The female (fig. 2) has, like all female gall-midges, the terminal abdominal segments modified into a long, protrusible ovipositor. By means of this organ the elongate white eggs are

Fig. 2.—Female of *Contarinia nasturtii*.
After Taylor. Magnified 30 times.

laid, according to Taylor's observations, mostly on the upper surfaces of the younger leaves in the heart of the crown. Here they feed in companies, mostly on the surface of the leaf-stalks, as Theobald and I had already noticed. The midges of the earliest

brood observed by Taylor were laying eggs on the plants in June, and three or four days after the eggs had hatched the plants began to show signs of damage. As Taylor points out, the amount of tissue which the grubs devour is small, but their presence leads to irritation and a responsive deformed growth—a swelling of the leaf-stalk bases and a crumpling of the leaves themselves. The central bud is often compressed, and its growth is checked or

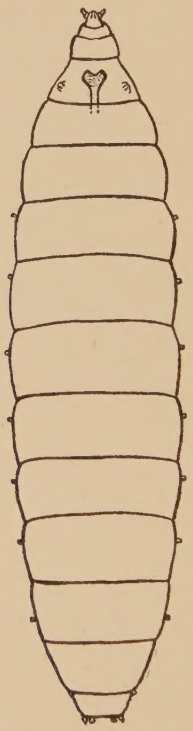

Fig. 3.—Larva of *Contarinia nasturtii*. Magnified 30 times.

stopped; then dormant lateral buds develop, and the crown of the root becomes surrounded by numerous small shoots, the plant assuming the condition that Taylor terms "many-necked." This condition follows the destruction of the central leading shoot—a disaster that may be caused by other agents than the swede midge grubs. But the "crumple-leaf" condition is always due, according to his experiments, to the presence of this particular insect.

In about three weeks the grubs are fully grown; then they bury themselves in the ground, and spin little globular cocoons within which they turn to pupæ. The pupal stage lasts also about three weeks. When the time for the emergence of the midge draws near, the pupa breaks out of its cocoon, and forces its way to the surface of the ground, the front part of its body projecting into the air. There are three (sometimes four) broods during the summer months, the latest appearing in September. The wintering stage is a buried pupa.

From the concealed position of the grubs while feeding it is obvious that no spray can be applied with any hope of success. Taylor, however, suggests an ingenious method of "trapping" the insects, which will, he believes, have the effect of greatly reducing their numbers if persevered in. The midges lay their eggs on the first suitable plants that they encounter after leaving the soil. His plan, therefore, is to sow a few rows of swedes around the "headlands" of a field where swedes have been grown, and attacked by the midges, in the previous year. The midges on emerging will lay their eggs on these young plants, which, a few days later, should be pulled up and burned, with the grubs that may be feeding between their leaf-stalks. Taylor suggests, as the result of his observations, that this destruction of the "decoy" plants should be carried out "about the end of June, by which date the first brood of midges has, for the most part, disappeared." Other cruciferous plants besides turnips are probably used by the midges for egg-laying, and further knowledge as to the species involved is much needed.

Fig. 4.—Pupa. After Taylor. Magnified 30 times.

The Dusky Crane-fly.

Trichocera fuscata, Mg.

In February, 1911, some swedes were received from Portadown, in which a large number of larvæ—similar in general structure to

the familiar "leather-jacket" grubs of the Crane-flies (*Tipula* spp.), but much smaller and more slender—were feeding. In the spring some of these pupated, and at midsummer a few flies

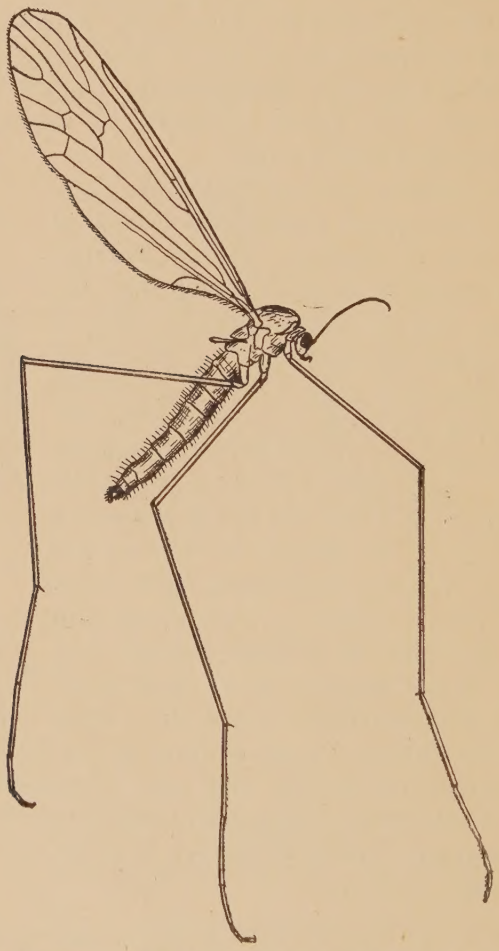

Fig. 5.—Dusky Crane-fly (*Trichocera fuscata*). Male. Magnified 8 times.

emerged from the pupæ; they proved to belong to the above-named species, which is probably common in Ireland. The genus Trichocera belongs to the Limnobine sub-family of the Crane-flies (Tipulidæ), distinguished from the Tipuline section (which

includes the familiar "daddy-long-legs") by the last segment of the foot being shorter (not longer) than the last segment but one, and by details of the wing-nervuration, the seventh (axillary) nervure being excessively short. *T. fuscata* (fig. 5) measures 5 mm. ($\frac{1}{5}$ inch) in length, and has a brownish grey body with dusky wings.

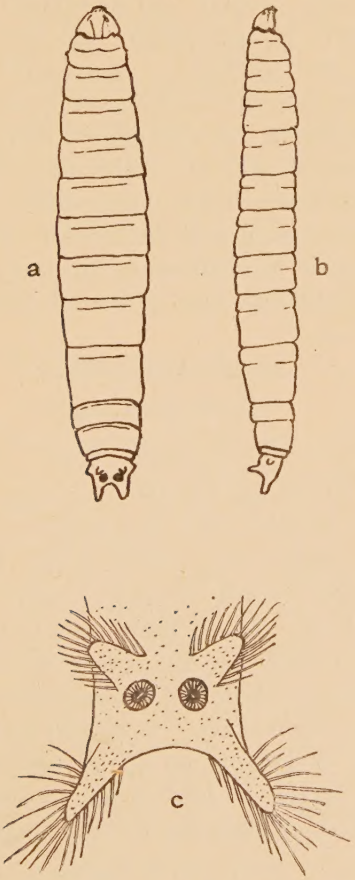

Fig. 6.—Larva of *Trichocera fuscata*; (*a*) dorsal view; (*b*) side view. Magnified 10 times; (*c*) dorsal view of terminal segment, showing processes and spiracles. Magnified 50 times.

The larva (fig. 6) is about 7 mm. long, and somewhat flattened dorso-ventrally. It has a distinct brownish head; the body-

segments have a flexible wrinkled cuticle, and the tail-segment, on which the large spiracles open (fig. 6, *c*), has three pairs of conspicuous conical processes beset with bristles. Besides the large tail-spiracles, there is a pair of very small air-holes situated laterally on the prothorax.

These larvæ are well known as eaters of fungi and of decaying vegetable tissues. They are mentioned as eating rotten turnips by Ormerod (8, pp. 14–16), who believed that they act simply as scavengers. In the case now recorded they were feeding on the fresh tissue of the swedes, and appeared to be the main cause of the decay that was spreading through the roots. In October my friend Dr. G. H. Pethybridge sent me from Co. Galway potato tubers which were being eaten by larvæ belonging to this or to another species of Trichocera. It seems, therefore, that these grubs must be regarded as distinctly harmful at times to underground plant-structures, as their relations the "leather-jackets" always are.

MANGEL INSECTS.

The Black Aphid.

Aphis rumicis, Linn.

The hot and dry summer of 1911 was very favourable for the rapid increase of aphids. This well-known species, described or mentioned in two former papers of this series (4, pp. 594–5; 5, pp. 10–11), was received in July from Cos. Clare and Wicklow, and in August from Cork. In the last-named instance it was not the aphids that were regarded by my correspondent as injurious, but a larva of the Seven-spot Ladybird (*Coccinella septempunctata*), which had been feeding upon them. It is well known that Ladybirds and their grubs, by preying on aphids and other plant-sucking insects, do some service at least to the farmer and gardener in keeping the numbers of the pests within bounds.

POTATO INSECTS.

The Frosted Orange Moth.

Gortyna ochracea, Hüb.

The stem-boring habit of the caterpillar of this moth in potato plants has been noticed in previous papers of this series (4, pp.

253–4, 573; 5, p. 11). During 1911 complaints of damage by the same insect were received from Co. Clare in June and from Kerry in July. One of my correspondents took the trouble of removing the caterpillar from the interior of the stem, or killing it by an injection of soap-suds and soda; he found that after this treatment the affected plants recovered.

The Turnip Moth.

Agrotis segetum (Linn.).

This common moth has already been described in this series of papers (4, pp. 432–4). In October, 1911, specimens from Co. Kildare were forwarded, with the information that they were devouring potato-tubers then being "raised." It is well known that these caterpillars readily eat many kinds of underground plant-structures, and there are many records of their ravages on potato-tubers.

The Blind White Springtail.

Isotoma fimetaria (Linn.).

In October my colleague Dr. G. H. Pethybridge sent me from Clifden, Co. Galway, potato-tubers eaten into holes which were tenanted by hundreds of little white springtails. These proved to belong to the species *Isotoma fimetaria*. Earlier in the year I had received the same species from Kew, where they were injuring lily bulbs. There is no doubt therefore that this springtail must be added to the many members of the order already known to be harmful to various cultivated plants.

In 1908 (4, pp. 574–6) I recorded a species of Isotoma, *I. tenella*, injurious to tobacco-leaves. In Isotoma the body, not covered with scales, is usually elongate, with distinct segmentation; the third and fourth abdominal segments are approximately equal in length; the spring is well developed; the feeler has four segments; and the post-antennal organ on the head, just behind the feelers, in front of the simple eyes, is oval in outline. *I. fimetaria* belongs to a section of the genus called Folsomia, and characterized by the fusion of the fourth, fifth, and sixth abdominal segments together. It is a delicate, white insect (fig. 7, *a*), only 1·6 mm. ($\frac{1}{16}$ inch) long, without eyes, but with the post-antennal

Fig. 7.—Blind Springtail (*Isotoma fimetaria*); (*a*) side view. Magnified 50 times. (*b*) base of right feeler with post-antennal organ; *c*. tip of foot with claws; (*d*) extremity of spring, showing end of dens and mucro. Magnified 400 times.

organ (fig. 7, *b*) distinct and narrowly oval. The foot-claws (fig. 7, *c*) are simple in form, and the mucro (or terminal claw-like segment) of the spring (fig. 7, *d*) has two upturned teeth.

These little insects are often found in numbers in garden soil, under flower-pots, and in similar concealed situations. It is easy therefore to understand how, under certain conditions, they may attack the succulent parts of plants that happen to be within their reach.

TOBACCO INSECTS.

A Tobacco-leaf Beetle.

Anthicus floralis (Linn.).

(Plate VIII., A.)

In May Mr. G. N. Keller, of the Department of Agriculture, brought some tobacco seedlings, the leaves of which were devoured by numbers of small beetles; Mr J. N. Halbert, of the National Museum, kindly identified these as *Anthicus floralis*. The Anthicidae are a family of small beetles belonging to the series of the Heteromera, the feet of the hindmost pair of legs having only four segments, while those of the front and intermediate legs have the normal five segments. The Anthicidæ have the head with a narrow neck; the prothorax is narrower than the elytra, and the claws are simple. *A. floralis* (Plate VIII., A) is 3·5 mm. ($\frac{1}{8}$ inch) long. It has the whole upper surface finely punctured; the head and the hinder part of the elytra are black, the thorax and the front half of the elytra brown. The feelers are brown with dark tips and the legs brown with dark thighs. The species of Anthicus are usually found in haystack refuse and similar substances; but *A. floralis* occurs at times on the leaves of plants.

The Turnip Moth.

Agrotis segetum (Linn.).

Caterpillars of this moth, mentioned on a previous page of this paper (p. 61) as injurious to potatoes, were found by Mr. Keller in August cutting the tobacco plants off at the surface of the ground. These caterpillars are well known to farmers on account

of this "surface" habit when attacking our familiar farm crops. We now see that they indulge in the same habit when attracted by the tobacco plots.

The Common Crane-fly.

Tipula oleracea (Linn.).

Mr. Keller informed me that the "leather-jacket" grubs were very destructive to the roots of tobacco plants in the spring and early summer, especially in the neighbourhood of rank pastures where the parent crane-flies had abounded in the preceding season. It appears that all our common native crop-pests take kindly to tobacco.

GARDEN INSECTS.

White Springtails.

Lipura ambulans (Linn.).

Specimens of this springtail were received in March from Co. Wexford, with the information that they were injuring seedling peas, celery, and potato. They have been described and several times referred to in this series of papers (4, pp. 251–3, 293–4, 298, 442) as injurious to various plants.

The Green Plant-bug.

Lygus pabulinus (Linn.).

Early in August specimens of this insect were received from Monaghan, with the information that they were very destructive to rose-buds and to young shoots. My correspondent (Dr. J. C. Hall) wrote: "They have done more damage to my roses this year than aphids and grubs combined, for once they attack a shoot, it seems to stop growing, and seldom or never forms a flower-bud."

The plant-bugs belong to the same order (Hemiptera) as the well-known "greenfly" and scale-insects. But while the latter are members of the sub-order Homoptera—in which the fore-wings do not usually differ markedly from the hind-wings in texture—the plant-bugs are included in the sub-order Heteroptera, in which the fore-wings are usually divided into distinct areas, most of which are firm, and protective in function. The present

species belongs to the family Capsidæ, which comprises most of the Heteroptera found in Ireland. The Capsidæ are, for the most part, bugs of narrow and elongate build, with slender legs and feelers. Their cuticle is more flexible and delicate than that of most other Heteroptera. The surface of the forewing is usually

Fig. 8.—Green Plant-bug (*Lygus pabulinus*). Magnified 4 times.

divisible into four areas (see fig. 8), known as the corium, clavus, cuneus (these three firm and protective), and membrane. Most of the Capsidæ feed by sucking the juices of plants (in all the Hemiptera there is an elongated, jointed, grooved beak or rostrum in which work two pairs of piercers), but they rarely attract notice by seriously damaging cultivated plants.

In the Capsidæ are comprised a large number of our native genera of plant-bugs. The species of Lygus (Saunders, 9, pp. 248, &c.) are oval in general form; the head has the face sub-vertical, and the vertex entirely or partly keeled, the beak (carried, pointing backwards, under the body) reaches to the bases of the legs of the third pair; the prothorax is convex above, with a narrow collar in front, and a raised base; the shins are armed with fine spines; and the middle segment of each three-segmented foot is slightly longer than the basal segment. *Lygus pabulinus* may be distinguished by its green colour, its very long and slender feelers, the incomplete keel across the vertex of its head (visible only at the sides near the eyes), and the very fine and minute spines on

the shins. It grows to a length of 6 mm. (about $\frac{1}{4}$ inch). In Ireland it is a common and widely spread species, found on many kinds of low-growing plants.

On account of the cuticle of these plant-bugs being much firmer and more resistant than that of the aphidæ or "Greenfly," the quassia or paraffin wash that is effective as a contact-poison in killing the latter insects will here be of little use, except perhaps against the youngest stages. Like most of the Hemiptera, these plant-bugs go through no marked transformations; the young resemble the adults, except for the absence of wings, which are gradually acquired during the stages of growth, throughout which the insect is active and continues to feed by suction. In the United States, where several insects of this group are injurious to foliage, the entomologists recommend that the insects be shaken off the plants and caught in vessels of paraffin and water.

The Onion Fly.

Hylemyia antiqua (Meig.).

(= *cepetorum*, Meade).

For the present record of serious damage to onions in the west of Ireland by the maggots of this well-known species, we have also to thank Dr. G. H. Pethybridge, who forwarded many specimens of the insect in its various stages during September and October.

The fly is closely allied to the Cabbage-fly (*Phorbia brassicæ*) described and figured in the first of this series of papers (4, pp. 141–4), and often recorded subsequently. It has generally been placed in the same genus (Phorbia) as the Cabbage-fly, but in the recent Catalogue of Bezzi and Stein (1, p. 688) it is included in Hylemyia. The Onion Fly is about 6·5 mm. ($\frac{1}{4}$ inch) long, slightly larger than the Cabbage Fly. As in that species, the male has a parallel-sided body, which is dark-grey in colour with four longitudinal brown stripes on the thorax, and a series of triangular black spots on the abdomen. The male Onion Fly differs from the male Cabbage Fly in not having the conspicuous tufts of black bristles at the base of the hind-leg, which distinguishes the latter species (fig. 10). The female Onion Fly (fig. 9*a*) is paler than the male, with the eyes more widely separated and the abdomen

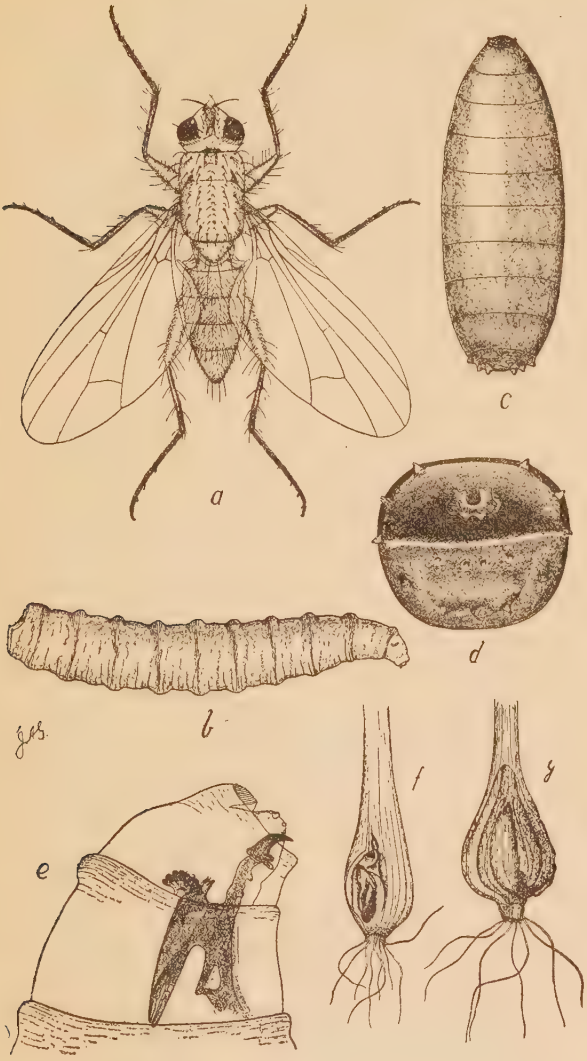

Fig. 9.—Onion Fly (*Hylemyia antiqua*); (*a*) Female; (*b*) larva, side-view; (*c*) puparium. Magnified 6 times. (*d*) tail-segments of larva, showing processes and spiracles. Magnified 20 times. (*e*) front end of larva, showing mouth-hooks. Magnified 35 times. (*f*) and (*g*) injured onions. After Smith and Dickerson.

pointed. She lays her eggs in April and May on the neck of the onion or on the leaves just above the surface of the ground. The young maggots are hatched about a week after the eggs have been laid, and eat their way between the sheathing leaves and into the bulb. In about a fortnight or three weeks after hatching the maggot is fully grown (fig. 9*b*), having attained a length of 8 mm. ($\frac{1}{3}$ inch). Like other maggots of its family (Anthomyidæ) and the muscoid flies generally, it is soft and white, with mouth-hooks (fig. 9*e*) at the tapering head-end for tearing up the food, and a pair of spiracles or air-holes, each with three slits, at the tail-end (fig. 9*d*, fig. 11*b*). The spiracular area is surrounded with conical prominences, which differ from those in

Fig. 10.—Hind-legs of (*a*) Male Onion Fly, and (*b*) Male Cabbage Fly. Magnified 20 times. From Smith and Dickerson.

the corresponding region of the Cabbage maggot in the hindmost pair not being bifid (fig. 11 *a*, *b*). The brown puparium (fig. 9*c*) is usually found in the soil, and from it the perfect fly of the next generation emerges in another fortnight. There are several successive broods during the summer and autumn, and as the onions increase in size, each may harbour a number of maggots,

which eat up the internal tissue and render the entire bulb rotten and useless. They are often found as late as November and December. In these countries the pupa is believed (2) to be the wintering stage, but Smith and Dickerson state (10) that in the United States the insect hibernates as a perfect fly.

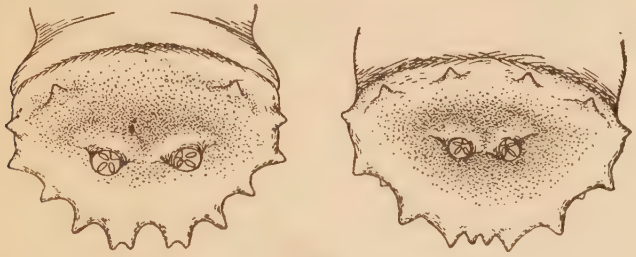

Fig. 11.—Spiracular areas of (*a*) Cabbage Maggot, and (*b*) Onion Maggot. Magnified 25 times. From Smith and Dickerson.

On account of the burrowing habits of the maggots, it is almost useless to apply insecticides to kill them. Badly infested onions should be lifted and burned, and the cultivator must turn his attention to methods of prevention. Earthing up the onion plants prevents the fly from laying her eggs. So do dressings of kainit or watering with paraffin emulsion (3 pints of paraffin, ½lb. of soft soap, and a gallon of boiling water, with 7 or 8 gallons of soft water subsequently added). According to the experiments of Smith and Dickerson, the most effective dressing is a compound of carbolic acid and lime. This is made by slaking 3 pints of lime with a gallon of water, and adding a tablespoonful of crude carbolic acid. The mixture must be watered around the plants, so as to form a crust extending over the surface of the soil, and closing around the plant-bases.

The Narcissus Fly.

Merodon equestris, Fab.

(Plate VIII., B, C.)

In October Narcissus bulbs in which the maggots of this fly were feeding were received from Valentia Island, Co. Kerry, and it was stated that many bulbs were infested in the same way. Probably the presence of this fly in Ireland is due to maggots

imported in bulbs from the European Continent; but they are able to complete their transformations in this country, and the fly is not infrequently seen on the wing in the month of May in the southern half of Ireland. The fly is a hairy insect, somewhat resembling a bumble-bee in appearance, and belongs to the same family (Syrphidæ) as the Drone-flies and their allies (Eristalis, Volucella), many of which also resemble bees. The flies of the genus Merodon may be distinguished by the presence of a strong tooth-like process below the tip of the hind thigh. They are covered with a dense hairy clothing, and the wings are short and rounded.

Merodon equestris is about 12 mm. ($\frac{1}{2}$ inch) long, robust in build, and highly variable in its coloration. The thorax is usually deep-black with a greyish band in front, and the abdomen is golden-

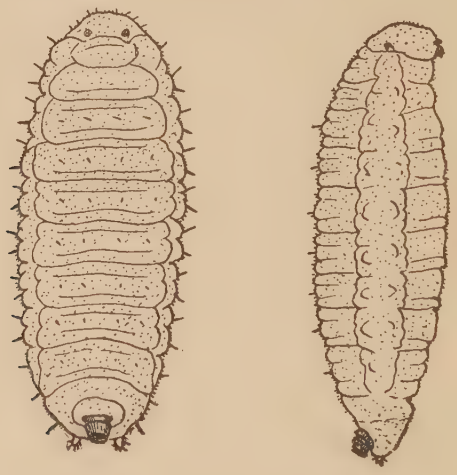

Fig. 12.—Maggot of the Narcissus Fly (*Merodon equestris*); (*a*) dorsal view; (*b*) lateral view. Magnified 4 times.

yellow with grey base, but entirely pale varieties are sometimes found; the legs are always jet-black. In the variety *narcissi* the thorax is pale-yellow and the abdomen grey (Plate VIII., B). According to Verrall, who gives an extended account of the insect and its varieties (14, pp. 555–60), the headquarters of the genus is southern Europe.

The female lays her eggs on the bulb; and it is noteworthy that the maggot, when hatched, always eats its way into the bulb from beneath. Theobald (12, pp. 107–8) states that maggots under his observation "attacked as many as ten bulbs before becoming mature." He continues: "When one bulb is destroyed they crawl through the soil and enter the next one at its base." As many as seven or eight young maggots may inhabit a single bulb, but a single bulb harbours one or at most two fully grown maggots (Plate VIII., c). They do not reach their full size till the late autumn or winter. Then they are stout and robust, tapering evenly to the head and tail ends. The spiracles open at a stout medium cylindrical prominence on the tail-segment, which bears also a pair of short spiny processes (fig. 12). There are small paired spiracles on the prothorax. The cuticle of the larva is covered with minute granulations and rows of bristles on the segments. The full-fed maggot forms a silk-lined chamber in the soil, within which its cuticle hardens to form the puparium. From the puparium the front spiracular processes project like horns. There seems to be only one life-cycle in the year, the flies emerging from these puparia in the ensuing spring.

Infested bulbs should be lifted and burned before mid-autumn, while the maggots are still feeding within them. After an attack the bed should be well dug, and the surface layer deeply buried, so that the pupæ may be too deep for the flies to emerge from them.

ORCHARD INSECTS.

The Apple Aphid.

Aphis pomi, De Geer.

An account, with figures, of this common insect was recently given in this series of papers (5, pp. 12–15, figs. 1, 2). On November 9th I received from Co. Fermanagh leaves of apple trees on which were numerous specimens of the wingless male and egg-laying female of this species. On account of the importance of autumn spraying to kill this particular generation of the insect, the date of the occurrence in Ulster is worthy of record.

The Pith Moth.

Blastodacna vinolentella (Herr.-Schäff).

This insect is not common in Ireland, and my two previous records of its occurrence are from the neighbourhood of Dublin 4, pp. 333–4, with description and figure; 576). Apple shoots from the south of Co. Dublin, sent at the end of June, 1911, contained pupæ of the moth.

The Raspberry Leaf-Miner.

Fenusa pumilio, Hartig.

(Plate IX., D.)

At midsummer, leaves of Raspberry mined by these sawfly larvæ were received from Kilkenny through Mr. W. S. Irving, of the Department of Agriculture; and in September similar leaves were sent from Co. Down, mined by the autumn-brood larvæ of the same species. This insect had never previously come under my notice, but I was informed that in Co. Kilkenny considerable damage had been done by it during the summers of 1909 and 1910. Damage by these larvæ to Raspberry in Great Britain is recorded by Cameron (3, vol. i, p. 300) and Theobald (13, p. 438).

The genus Fenusa includes a small number of species of sawflies characterized by the short, thick body and the feelers with nine or ten segments. The larvæ of all of them mine in the leaves of plants of various kinds. *F. pumilio* is a small, black sawfly, measuring 3·5 mm. ($\frac{1}{7}$ inch) long, with long feelers, whitish legs, and smoky wings.

The caterpillars, which mine the leaves of Bramble as well as Raspberry, are interesting on account of their modification for this peculiar mode of life (fig. 13). The body is flattened, and the thoracic segments are greatly broadened, so that the short jointed legs are hardly visible from above. In the young larva the cuticle is soft and pale, except that the head, a dorsal shield, and an extensive ventral area on the prothorax and small ventral areas on the mesothorax and metathorax are firm and hard. There are

short prolegs on the abdominal segments from the second to the seventh inclusive, each proleg marked with a dark semicircle ; the anal prolegs on the tenth segment are surrounded by a dark, chitinous ring. According to Cameron (3, vol. i., p. 299), the fully fed larva, which attains a length of 20 mm. ($\frac{4}{5}$ inch), has no dark markings.

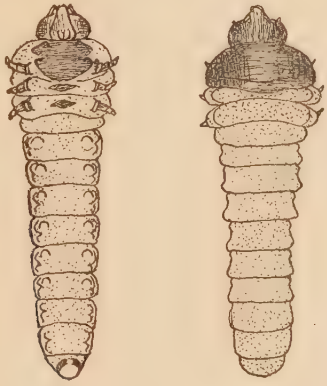

Fig. 13.—Young Caterpillars of the Sawfly *Fenusa pumilio* (*a*) ventral view ; (*b*) dorsal view. Magnified 10 times.

These larvæ form extensive irregular blisters between the upper and lower leaf-skins, eating out the internal green tissue: in a large leaf five or six larvæ may be found at once. (Plate IX., D.) There are two broods in the year, the summer larvæ feeding during July and August, and those of the autumn generation in September and October, according to Cameron. The pupal stage is passed either in the leaf-blister or buried in the soil.

Spraying is useless for destroying these sheltered larvæ. In small gardens it is easy to recognize the presence of the young caterpillars and to crush them within the leaf by pressure of the fingers.

FOREST PESTS.

The Pine Weevil.

Hylobius abietis (Linn.).

Reference to this destructive insect has been often made in this series of papers (4, pp. 154–5, 443; 5, p. 21). In May serious

damage by the weevils was noticed in Co. Wexford to Scots pine, and during November they ate the bark off larch and firs in Co. Cork.

The Red Pine Sawfly.

Lophyrus rufus, Klug.

On several occasions attention has been called to damage done in Ireland by caterpillars of the common Pine Sawfly (*Lophyrus pini* (See 4, pp. 447-8, fig. 10, 583, 607; 5, p. 21). In June, 1911, Mr. A. C. Forbes noticed on pines at Avondale, Co. Wicklow, caterpillars from which flies of the species *L. rufus* were reared in July. The life-history of *L. rufus* closely resembles that of *L. pini*, there being in both cases two complete life-cycles in the year. The female of *L. rufus* is of a uniformly reddish colour, with the hind-thorax and the base of the abdomen sometimes black; the male is black with red legs. In both sexes there are twenty-three segments in the feeler, a larger number than in any other Britannic species of Lophyrus, according to Cameron (3, vol. iii, p. 73); in *L. pini* the feeler has only twenty segments. In *L. rufus*, as in *L. pini*, the male's feelers are beautifully comb-like. While the caterpillar of *L. pini* is green with black spots, that of *L. rufus* is pale greyish-green, with two broad blackish stripes down the back, and interrupted black stripes on each side along and below the spiracles.

The Larch Sawflies.

Nematus Erichsonii, Hartig, and *N. laricis*, Hartig.

(Plate IX., E, F.)

Caterpillars of both these species were found on larch at Avondale, in June, by Mr. A. C. Forbes. The former occurred very sparingly, but the latter was present in considerable numbers.

Nematus Erichsonii, the Large Larch Sawfly, has attracted much attention during recent years in Great Britain on account of the damage done by its caterpillars in larch plantations. For example,

an extensive wood belonging to the Manchester Corporation, near Thirlmere, in the Cumbrian Lake district, was almost stripped of leaves by these insects. The fly belongs to the section Lygæonematus of the large and comprehensive genus Nematus, which includes the well-known Gooseberry Sawfly (*N. ribesii*). The female of *N. Erichsonii* (Plate IX., E) measures 9 mm. ($\frac{3}{8}$ inch) in length; she is black in colour, with a reddish band across the abdomen, and with the legs mostly yellowish. The male insect is very rare, and it has been shown by Dr. R. Stewart MacDougall that where the Sawflies are so numerous as to cause a veritable plague, the generations are parthenogenetic. The caterpillar is about 18 mm. ($\frac{3}{4}$ inch) in length, with black head and legs, and the body black or greyish-green above and yellowish-green below. The fly has but one life cycle in the year, the female laying her eggs in late spring or early summer, and the caterpillars feeding until August. When numerous the caterpillars feed in clusters, and, in bad cases, the trees are completely stripped of leaves. When fully grown, the caterpillars descend to the ground, burrow into the turf around the trees, and spin cocoons in which they spend the winter, not pupating until the following spring.

The sudden appearance of this species as a seriously destructive insect in England in 1906 is noteworthy, since Cameron in 1885 (3, vol. ii, p. 51) recorded only two English specimens. It is widely spread in Northern and Central Europe, being known as a pest by German foresters, and it is found in North America. It is also of interest to know that since its outbreak at Thirlmere the Sawfly has been greatly kept in check by the activity of enemies such as ichneumon flies.

Hewitt and Mangan (7) have traced the gradual reduction in the numbers of *N. Erichsonii*, through the attacks chiefly of *Mesoleius aulicus*, Grav. In 1908, 6 per cent. of the Sawfly cocoons collected were parasitized; in 1909, 15 per cent.; and in 1910, 62 per cent. The caterpillars are also devoured greedily by small birds such as Tits, and these birds were encouraged in Westmoreland by the provision of nesting boxes.

Evidently the species is one whose presence in Ireland should be noted and watched, as it might at any time increase, so as to become a pest. It is possible that the excessive multiplication

of the insect noticed at Thirlmere and elsewhere may be always the result of parthenogenetic reproduction.

Nematus laricis, the smaller Larch Sawfly (Plate IX., F), is a black insect measuring only 6 mm. (about $\frac{1}{4}$ inch) in length. Its caterpillar is uniformly pale green, with brown head. Although they were present at Avondale in considerable numbers, they do not seem to be seriously injurious.

Slugs.

Arion ater (Linn.) and *Agriolimax agrestis* (Linn.).

We are further indebted to Mr. A. C. Forbes for calling attention to some unusual enemies of coniferous timber trees. He found, early in July, that in a plantation of Weymouth Pine, thirty per cent. of the trees, over the area of an acre, had the bark eaten in patches. The only animals that could be traced to the injured trees were slugs of the above common species.

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EXPLANATION OF PLATES VIII. AND IX.

A. Tobacco Leaf-beetle (*Anthicus floralis*). Magnified four times.

B. Narcissus Fly, *Merodon equestris*. Twice natural size.

C. Narcissus Bulbs with Maggot of (*Merodon equestris*). Twice natural size.

D. Raspberry Leaf blistered by the larvæ of *Fenusa pumilio*.

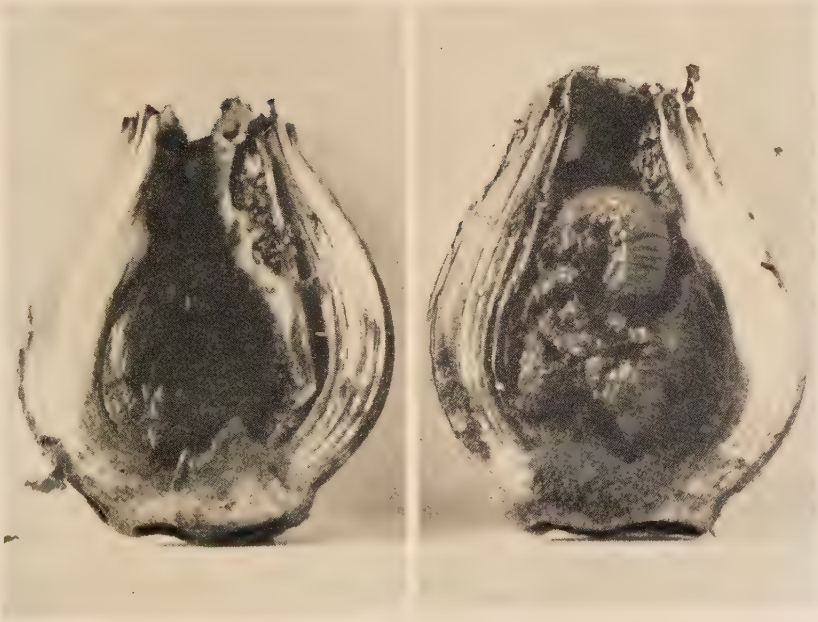
E. Large Larch Sawfly (*Nematus Erichsonii.*) Magnified three times.

F. Small Larch Sawfly (*Nematus laricis.*) Magnified three times.

[Photographs by T. Price.]

A

B



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